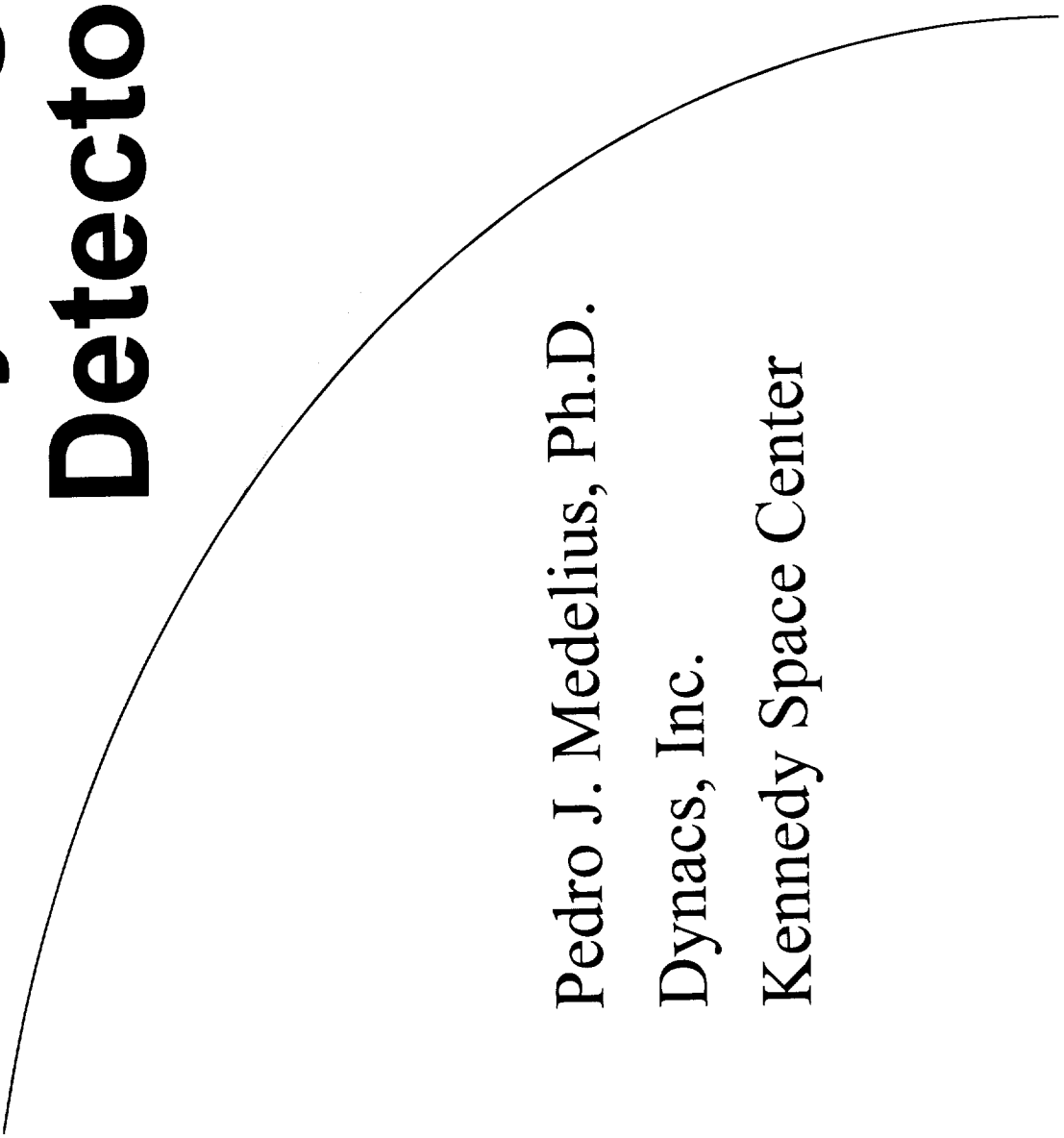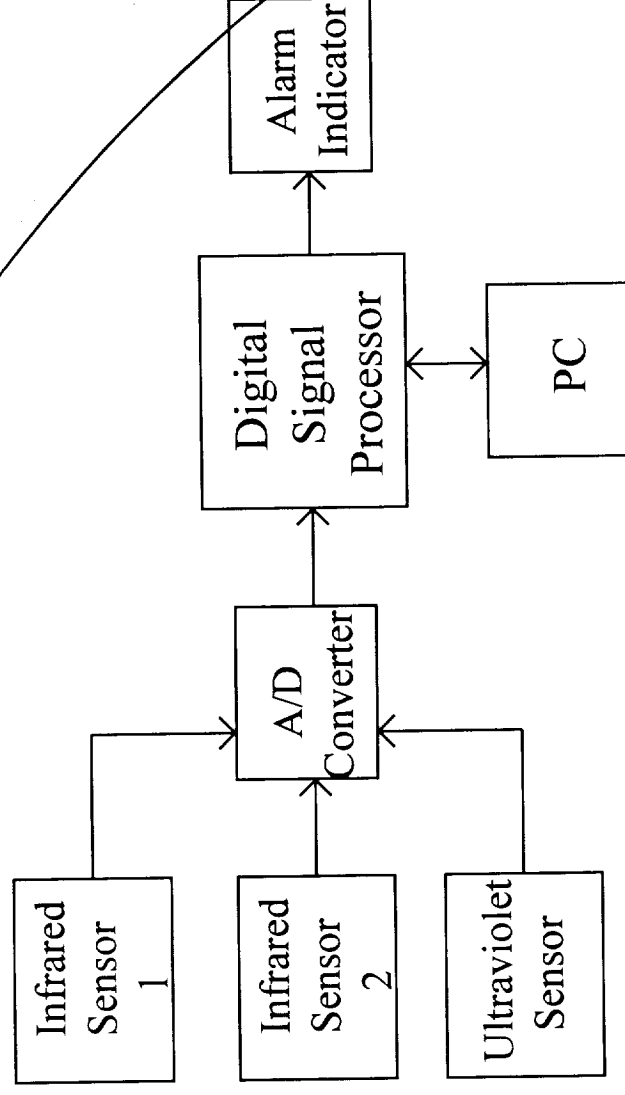51863

UV-IR Hydrogen Fire Detector

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Block Diagram

Figure 1. UV-IR Hydrogen Flame Detector – Block Diagram

Design Objectives

- To design a sensor than can accurately determine the presence of a hydrogen fire within its field of view.

- To eliminate the main cause of false alarms: reflections from the flare stack.

Technical Approach

- Simultaneous measurements of infrared and ultraviolet radiation are conducted.

- Infrared measurements are done at one or more wavelengths.

- Ultraviolet measurements are conducted using solar-insensitive detectors.

Technical Approach

- Digital Signal Processing (DSP) algorithms are used to determine the presence of a fire within the field of view, while eliminating the effects of reflections from other sources.

- The presence of simultaneous UV and IR radiation is not necessarily an indication of a hydrogen fire within the field of view.

Initial Testing

- Measurements of hydrogen flames were conducted at Stennis Space Center.

- Measurements of UV and IR radiation were taken on both small flames and large flare stacks.

- The effects of reflections were analyzed and characterized in detail.

Initial Testing

- Main differences between the radiation from the flare stack and the small flames were identified.

- DSP algorithms were developed to discriminate between small flames, large flames, and solar reflections.

Sensor Testing

- Final sensor testing conducted at Kennedy Space Center.

- Additional features were incorporated after field testing, including remote gain/sensitivity adjustment and remote data downloading capabilities.

Intellectual Property

- U.S. Patent number 5,625,342 was issued on April 29, 1997. The patent is titled: "Plural-wavelength flame detector that discriminates between direct and reflected radiation."

Patented Technology

- The flame detector employs a plurality of wavelength selective radiation detectors and a digital signal processor programmed to analyze each of the detector signals, and determines whether radiation is received directly from a small flame source that warrants generation of an alarm.

Patented Technology

- The processor's algorithm employs a normalized cross-correlation analysis of the detector signals to discriminate between radiation received directly from a flame and radiation received from a reflection of a flame to insure that reflections will not trigger an alarm.

Patented Technology

- In addition, the algorithm employs a Fast Fourier Transform (FFT) frequency spectrum analysis of one of the detector signals to discriminate between flames of different sizes

Patented Technology

- The actual implementation of the detector incorporates two infrared (IR) detectors and one ultraviolet (UV) detector for discriminating between a directly sensed small hydrogen flame, and reflections from a large hydrogen flame.

Licensing

- The UV-IR Hydrogen Flame Detector technology is available for licensing.

- Complete schematic, printed circuit board design, digital signal processing methods, and bill of material information will be provided upon licensing.

Licensing

- For additional licensing information, please contact: ???